

WHAT IS CLAIMED IS:

1. A multilayer film comprising:

(A) a first layer comprising:

- 5 (i) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent,
- (ii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein, and
- 10 (iii) a crosslinking agent comprising a compound with at least two carbonyl groups; and

(B) a second layer comprising a non-water-soluble thermoplastic polymer comprising at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl chloride, and polystyrene; and

15 wherein each of the additive, binder, and crosslinking agent are present throughout a thickness of the first layer.

2. The multilayer film according to Claim 1, wherein the additive comprises at least one member selected from the group consisting of caramel, liquid smoke, FD&C

20 Blue No 1, FD&C Blue No 2, FD&C Green No 3, FD&C Green No 6, FD&C Orange B, FD&C Red No 3, FD&C Red No 40, FD&C Yellow No 5, FD&C Yellow No 6, a lake of one or more FD&C colorant, natural brown, annatto extract, beet powder, canthaxanthin, β -Apo-8'-carotenal, carotene, cochineal extract, carmine, grape color extract, synthetic iron oxide, paprika, riboflavin, and titanium oxide, malt, natural colorant, spice,

25 bacteriocin, allyl isothiocyanate, monolaurin, 1-[2-(2,4-dichlorophenyl)-2-(propenyloxy)ethyl]-1H-imidazole, silver, benzoic acid, benzoate, hydroxycinnamic acid derivative, essential oil, sorbic acid, salt of sorbic acid, benzoate, methyl p-hydroxybenzoate, propyl p-hydroxybenzoate, p-hydroxybenzoic acid, sodium benzoate,

propionic acid, salt of propionic acid, sodium lactate, dimethyl dicarbonate, diethyl dicarbonate, sulfite, diethyl pyrocarbonate, EDTA, butylated hydroxyanisole, butylated hydroxytoluene, propyl gallate, dilauryl thiodipropionate, thiodipropionic acid, gum guaiac, tocopherol, acetate, citrate, gluconate, oxystearin, ortho-phosphate, meta-phosphate, pyro-phosphate, polyphosphate, phytate, sorbitol, tartrate, thiosulfate, and lysozyme,

3. The multilayer film according to Claim 1, wherein the additive comprises a colorant and the multilayer film, when subjected to a Standard Mottling Test, exhibits a Gray Scale standard deviation of from about 0 to 20.

4. The multilayer film according to Claim 1, wherein the additive comprises a colorant and the multilayer film, when subjected to a Standard Mottling Test, exhibits a Gray Scale standard deviation of from about 0 to 18.

5. The multilayer film according to Claim 1, wherein the additive comprises a colorant and the multilayer film, when subjected to a Standard Mottling Test, exhibits a Gray Scale standard deviation of from about 12 to 18.

6. The multilayer film according to Claim 1, wherein the additive comprises a colorant and the multilayer film, when subjected to a Standard Mottling Test, exhibits a Gray Scale standard deviation of from about 0 to 16.

7. The multilayer film according to Claim 1, wherein the additive comprises a colorant and the multilayer film, when subjected to a Standard Mottling Test, exhibits a Gray Scale standard deviation of from about 0 to 14.

8. The multilayer film according to Claim 1, wherein the binder comprises at least one member selected from the group consisting of alginate, methyl cellulose, hydroxypropyl starch, hydroxypropylmethyl starch, hydroxymethyl cellulose, hydroxypropyl cellulose, hydroxypropylmethyl cellulose, carboxymethyl cellulose, cellulose esterified with 1-octenyl succinic anhydride, chitin, and chitosan, gliadin, glutenin, globulin, albumin, prolamin, thrombin, pectin, canageenan, konjac flour-glucomannin, fibrinogen, casein, soy protein, whey protein, and wheat protein.

9. The multilayer film according to Claim 1, wherein the binder comprises at least one member selected from the group consisting of:

(A) polysaccharide esterified with at least one member selected from the group consisting of: acetic anhydride, propionic anhydride, alkyl-propionic anhydride, butyric anhydride, alkyl-butyric anhydride, succinic anhydride, alkyl-succinic anhydride, maleic anhydride, alkyl-maleic anhydride, adipic anhydride, alkyl-adipic anhydride, and vinyl acetate; and

(B) polysaccharide etherified with at least one member selected from the group consisting of acrolein, epichlorhydrin, ethylene glycol, ethylene glycol oligomer, propylene glycol, propylene glycol oligomer, ethylene oxide, and propylene oxide.

10. The multilayer film according to Claim 1, wherein the binder comprises:

(A) a first binder comprising at least one member selected from the group consisting of alginate, methyl cellulose, hydroxypropyl starch, hydroxypropylmethyl starch, hydroxymethyl cellulose, hydroxypropyl cellulose, hydroxypropylmethyl cellulose, carboxymethyl cellulose, cellulose esterified with 1-octenyl succinic anhydride, chitin, and chitosan; and

(B) a second binder comprising at least one member selected from the group consisting of gliadin, glutenin, globulin, albumin, prolamin, thrombin, pectin, canageenan,

konjac flour-glucomannin, fibrinogen, casein, soy protein, whey protein (especially whey milk protein), and wheat protein.

11. The multilayer film according to Claim 1, wherein the binder comprises
5 hydroxypropyl starch.

12. The multilayer film according to Claim 1, wherein the binder comprises at least one member selected from the group consisting of:

- 10 (A) at least one member selected from the group consisting of polysaccharide esterified with an anhydride of the formula: $[\text{CH}_3(\text{CH}_2)_n\text{-CO}]_2\text{-O}$, where $n =$ from 0 to 6, as well as alkyl-substituted anhydrides thereof;
 - (B) $\text{CH}_3(\text{CH}_2)_n\text{-COCl}$, where $n =$ from 0 to 6;
 - (C) alkyl-substituted acid chlorides of $\text{CH}_3(\text{CH}_2)_n\text{-COCl}$, where $n =$ from 0 to 6;
 - 15 (D) modified polysaccharide which results from the etherification of a base polysaccharide with at least one member selected from the group consisting of acrolein, epichlorohydrin, ethylene glycol, ethylene glycol oligomer, propylene glycol, propylene glycol oligomer, ethylene oxide, and propylene oxide; and
- wherein the second layer comprises at least one member selected from the group consisting of polyamide 6, polyamide 66, polyamide 9, polyamide 10, polyamide 11,
20 polyamide 12, polyamide 69, polyamide 610, polyamide 612, polyamide 6I, polyamide 6T, polyamide MXD6, copolyamide, polyethylene homopolymer, ethylene/alpha-olefin copolymer, anhydride-modified ethylene/alpha-olefin copolymer, ethylene/vinyl acetate copolymer, ethylene/acrylic acid copolymer, ionomer (especially ionomers of ethylene/methacrylic acid and ethylene/acrylic acid), ethylene/methacrylic acid
25 copolymer, anhydride-modified ethylene/methacrylic acid copolymer, polypropylene homopolymer, propylene/ C_{4-10} alpha-olefin copolymer, polyethylene terephthalate, PETG, and polyalkylhydroxy acid.

13. The multilayer film according to Claim 1, wherein the crosslinking agent comprises at least one member selected from the group consisting of malose, glutaraldehyde, glyoxal, dicarboxylic acid, ester of dicarboxylic acid, urea formaldehyde, melamine formaldehyde, trimethylol-melamine, organic compound containing at least 2
5 sulfhydryl groups, and a component in liquid smoke comprising at least two carbonyl groups.

14. The multilayer film according to Claim 1, wherein the additive is bound to the binder with at least one member selected from the group consisting of a covalent bond, an
10 ionic bond, a hydrogen bond, and a dipole-dipole interaction.

15. The multilayer film according to Claim 1, wherein the second layer is directly adhered to the first layer.

15 16. The multilayer film according to Claim 1, further comprising a third layer which is between the first layer and the second layer.

17. The multilayer film according to Claim 16, wherein the third layer comprises at least one member selected from the group consisting of polysaccharide and protein.
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18. The multilayer film according to Claim 1, further comprising a third layer, with the first layer being between the second layer and the third layer.

19. The multilayer film according to Claim 18, wherein the third layer comprises
25 at least one member selected from the group consisting of polysaccharide and protein.

20. The multilayer film according to Claim 19, further comprising a fourth layer which is between the first layer and the second layer.

21. The multilayer film according to Claim 1, wherein the multilayer film when subjected to a Standard Mottling Test, exhibits a mottling level of from about 1 to about 2.5.

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22. The multilayer film according to Claim 1, wherein the first layer further comprises a plasticizer.

23. The multilayer film according to Claim 1, wherein the plasticizer comprises at least one member selected from the group consisting of polyol, sodium citrate, and triethyl citrate.

24. The multilayer film according to Claim 1, further comprising a third layer comprising at least one member selected from the group consisting of polyolefin, polyamide, and polyester.

25. The multilayer film according to Claim 24, wherein the third layer comprises at least one member selected from the group consisting of ethylene/vinyl alcohol copolymer, vinylidene chloride copolymer, polyamide, polyvinyl alcohol, polyhydroxyaminoether, and polyalkylene carbonate, ethylene/acrylic acid copolymer, polyethylene terephthalate, and ionomer.

26. The multilayer film according to Claim 24, wherein the third layer is an inner layer, the multilayer film further comprising a fourth layer comprising at least one member selected from the group consisting of polyolefin, polyamide, and polyester. [more preferably: ethylene/vinyl alcohol copolymer, vinylidene chloride copolymer, polyamide, polyvinyl alcohol, polyhydroxyaminoether, and polyalkylene carbonate, ethylene/acrylic acid copolymer, polyester, and polyethylene terephthalate.

27. The multilayer film according to Claim 1, wherein:

(A) the second layer serves as a seal layer and comprises at least one member selected from the group consisting of polyolefin, polyamide, and polyester;

5 (B) the film further comprises:

(i) a third layer which serves as an O₂-barrier layer comprising at least one member selected from the group consisting of at least one member selected from the group consisting of ethylene/vinyl alcohol copolymer, polyvinylidene chloride, polyamide, polyalkylene carbonate, polyvinyl alcohol, and polyester;

10 (ii) a fourth layer which serves as a first tie layer and which is on a first side of the O₂-barrier layer and which comprises at least one member selected from the group consisting of modified ethylene/alpha-olefin copolymer, modified ethylene/unsaturated ester copolymer, modified ethylene/unsaturated acid copolymer, polystyrene and polyurethane; and

15 (iii) a fifth layer which serves as a second tie layer and which is on a second side of the O₂-barrier layer and which comprises comprising at least one member selected from the group consisting of modified ethylene/alpha-olefin copolymer, modified ethylene/unsaturated ester copolymer, modified ethylene/unsaturated acid copolymer, polystyrene and polyurethane; and

20 (iv) a sixth layer which serves as an abuse layer and which comprises at least one member selected from the group consisting of polyolefin, polyamide, polyester, and polyurethane.

28. The film according to Claim 27, further comprising:

25 (i) a seventh layer which serves as a strength layer and which is between the second layer and the fourth layer, and which comprises at least one member selected from the group consisting of polyolefin, polyamide, polyester, and polyurethane;

(ii) a eighth layer which serves as a strength and balance layer and which is between the fifth layer and the sixth layer, and which comprises at least one member selected from the group consisting of polyolefin, polyamide, polyester, and polyurethane; and

(iii) a ninth layer which serves as a strength and moisture barrier layer and
5 which between the fifth layer and the sixth layer, and which comprises polyamide.

29. A process for preparing a cooked food product, comprising:

(A) packaging a food product in a multilayer film comprising:

(1) a first layer comprising:

10 (i) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent,

(ii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein,

15 (iii) a crosslinking agent comprising a compound having at least two carbonyl groups; and

(2) a second layer comprising a non-water-soluble thermoplastic polymer comprising at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl
20 chloride, and polystyrene; and

wherein each of the additive, binder, and crosslinking agent are present throughout a thickness of the first layer; and

(B) cooking the food product while the food product is packaged in the multilayer film.

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30. The process according to Claim 29, wherein the food product comprises at least one member selected from the group consisting of beef, pork, chicken, turkey, fish, and meat-substitute.

31. The process according to Claim 29, wherein the food product is cooked at a temperature of from about 145°F to 205°F for a duration of from about 1 to 12 hours.

5 32. A process for preparing a cooked food product, comprising:

(A) packaging a food product in a multilayer film comprising:

(1) a first layer comprising:

(i) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent; and

(ii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein; and

wherein the first layer is free of crosslinking agent; and

(2) a second layer comprising a non-water-soluble thermoplastic polymer comprising at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl chloride, and polystyrene; and

wherein each of the additive, and the binder are present throughout a thickness of the first layer; and

(B) cooking the food product at a temperature of from about 170°F to 260°F for a duration of from about 1 to 20 minutes, followed by cooking the food product at a temperature of from about 145°F to 205°F for a duration of from about 1 to 12 hours.

25 33. A process for making a coated multilayer film, comprising:

(A) coating an outer surface of a substrate film with a film-forming coating composition comprising:

(i) water;

- (ii) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent,
 - (iii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein, and
 - (iv) a crosslinking agent comprising a compound having at least two carbonyl groups; and
- (B) drying the coating composition whereby the composition becomes a first layer, the substrate film comprising at least a second layer; and
- wherein the substrate film comprises at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl chloride, and polystyrene.

34. The process according to Claim 33, wherein the coating composition is applied to the film using at least one member selected from the group consisting of roll, gravure, flexographic, meyer rod, reverse angle doctor blade, knife over roll, two roll reverse, three roll reverse, comma roll, and lip coating.

35. An article comprising a multilayer film comprising:

- (A) a first layer comprising:
 - (i) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent,
 - (ii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein, and
 - (iii) a crosslinking agent comprising a compound having at least two carbonyl groups; and

(B) a second layer comprising a non-water-soluble thermoplastic polymer comprising at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl chloride, and polystyrene; and

5 wherein each of the additive, binder, and crosslinking agent are present throughout a thickness of the first layer, and wherein the second layer is sealed to itself or another film.

10 36. The article according to Claim 35, wherein the first layer extends over only a portion of the second layer.

37. The article according to Claim 35, wherein the article comprises at least one member selected from the group consisting of a bag, a backseamed casing, a pouch, and a thermoformed article.

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38. A packaged product comprising:

(A) a film comprising a non-water-soluble thermoplastic polymer comprising at least one member selected from the group consisting of polyolefin, polyamide, polyester, polyvinylidene chloride, polyvinyl chloride, and polystyrene;

20 (B) a cooked meat product comprising at least one member selected from the group consisting of beef, pork, chicken, turkey, fish, and meat-substitute; and

(C) a layer between the film and the cooked meat product, the layer comprising:

25 (i) an additive comprising at least one member selected from the group consisting of flavor, fragrance, colorant, antimicrobial agent, antioxidant, chelating agent, and odor absorbent,

(ii) a binder comprising at least one member selected from the group consisting of polysaccharide and protein, and

(iii) a crosslinking agent comprising a compound with at least two carbonyl groups; and

wherein each of the additive, binder, and crosslinking agent are present throughout a thickness of the first layer.

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39. The packaged product according to Claim 38, wherein the layer between the film and the cooked meat product is preferentially adhered to the meat product.